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Attorney Docket No.: 2003UR021/2
Response to Final OA dated 04.017.08

REMARKS

In the office action mailed April 17, 2008, the examiner rejects all pending, non-withdrawn claims as obvious in view of the combination of three references: Behrens, Bernd, and Cosentino. The applicants wish to make the following arguments.

Independent claims 52 and 61

Background Summary: Both independent claims 52 and 61 are drawn to a method for increasing the rise time of air bubbles emitted by a diffuser in water by applying a chemical additive to the diffuser's surface. (Explanation from the specification: The bubble curtain lasts longer if the bubbles rise slowly.) The chemical additive can be either one that has wetting agent properties, or one that retards bubble coalescence (where small bubbles combine to make a larger bubble). It is believed that the examiner has based his rejections on the theory that the cited art shows use of bubble coalescence retarding chemicals, but wetting agents are also addressed later in this response. The difference between claims 52 and 61 is that in 52 the additive is painted on to the diffuser's surface with a brush whereas in 61 it is sprayed on. (More explanation: large bubbles rise faster than small bubbles.) A brief description of each of the three obviousness references is next.

Behrens discloses using air bubbles emitted by a diffuser (a *bubble curtain*) to suppress noise in a seismic survey. No use of chemical additives is disclosed or suggested. Bernd discloses a method of concealing a ship from sonar detection by a submarine, the method being a way of prolonging the life of the bubbles in the ship's wake by introducing into the water in the vicinity of the bubbles a chemical additive that will tend to prevent the bubbles from disappearing by dissolving into the water. Cosentino discloses a method of initially priming a blood oxygenator used in open heart surgery to more efficiently flush out extraneous gas by coating the oxygenator surfaces with a wetting agent that prevents the gas from clinging to the surfaces in small bubbles and interfering with the transfer of oxygen to the blood.

Argument

1. None of the three references recognizes that a bubble curtain will last longer if the bubbles rise to the surface more slowly, i.e., that surface blow-outs are a main limiting factor in bubble curtain life. In fact, none of the references disclose or suggest any "method for increasing the rise time of air bubbles emitted from a diffuser in water." (All claims) Only Bernd is concerned with bubble curtain duration. He thinks the threat to duration is absorption of the air in the surrounding water, not fast rise time.

2. Only Bernd and Cosentino disclose use of chemical additives. Neither teaches nor suggests that the additive should retard bubble coalescence (see item 3). Neither teaches that the additive should be either brush painted or spray painted on to the diffuser's surface. Cosentino doesn't even disclose a diffuser; his problem is to flush out residual bubbles. Bernd injects an additive into the ocean in the vicinity of his bubble diffuser. (This mode of application was also included in the applicants' original claims (see independent claim 41), but the examiner restricted it as a separate invention. It being a non-elected species, the similar art has no direct relevance.)

3. Neither Bernd's additive nor Cosentino's retards bubble coalescence. Bernd teaches an additive designed to prevent bubbles from disappearing by dissolving in water. Cosentino teaches a wetting agent that prevents existing bubbles from adhering to surfaces and thus resisting being flushed out.

4. None of the three references recognizes that bubble coalescence decreases bubble rise time. Only Bernd considers bubble curtain duration (see item 1), and only Behrens mentions bubble coalescence. Behrens's concern with bubble coalescence is limited to wanting a distribution of bubble sizes. He prefers large bubbles, but he is concerned that all the smaller bubbles will become big bubbles through coalescence. His solution for that is to increase the orifice spacing in his bubble diffuser.

5. The examiner contends that it would be obvious to extend Cosentino to show applying the additive by brush or spray. Yet Cosentino flushes a device that is not a bubble diffuser with an additive that is not selected to retard bubble coalescence. The applicants respectfully suggest that an article on house painting would have been closer to the mark. Moreover, the oxygenator surfaces that Cosentino coats by

flushing are coated to prevent bubbles from adhering to them, like a non-stick frying pan. That a one-time coating would work for that objective is no indication that it would be sufficient to alter the properties of bubbles after all contact with the surface is gone. Thus, Cosentino coats a surface to affect a property of the surface, whereas the applicants coat a surface to affect a (different) property of bubbles emitted through orifices in the surface.

Most of these arguments (and more) are stated in more detail, with column and line cites, in the applicants' response filed 1/18/2008. Based on the Office Action mailed 4/17/2008, the applicants believe that the examiner does not disagree with any of these arguments except possibly the subjective part of item 5 (what might or might not be obvious from reading Cosentino). Instead, the examiner's position apparently is that an obviousness case can be sustained despite these impediments. The applicants believe that items 1 and 4 (and also item 5) show that even if all features of the applicants' claims could be selected piecemeal from the menu of the three cited references, there would be no suggestion of how to fit them up to solve the applicants' technical problem (or that such a solution would work – see item 5) without the hindsight roadmap provided by the applicants' claims.

Moreover, some features of the applicants' claims simply cannot be found in the references at all. Where (item 5) is the feature “applying a chemical additive to the diffuser's surface with a brush [or by spray painting]”? More significantly, where (item 3) is a disclosure of a “chemical additive having bubble coalescence retardation properties”? Neither of these two claim feature appears in any of the three references. Attention is directed to the fourth paragraph on page 2 (extending into page 3) of the final Office Action (mailed 04/17/2008). The examiner poses an important factual issue in the first sentence (whether the art teaches increasing rise time by preventing bubbles from coalescing), but the applicants believe that the rest of the paragraph is not responsive to the issue and does not support the examiner's position on this issue.

Independent claims 70, 79 and 83

These claims differ from claims 52 and 61 only in that the chemical additive is applied by dunking the diffuser in a container of additive. Therefore, the preceding arguments are all applicable except the argument that the art doesn't show brush or

spray painting the additive on to the diffuser surface. The applicant believes the remaining arguments are sufficient to show that claims 70, 79 and 83 are also non-obvious.

Wetting agent additives

Wetting agent additives may also be used in the claimed invention for prolonging bubble curtains. The inventive logic is again that small bubbles rise more slowly. Cosentino does disclose a wetting agent additive, but he does not teach a purpose for it that would suggest any value in prolonging bubble curtains. Cosentino coats his oxygenator box with the wetting agent so that residual bubbles will not cling to it, and thus be free to be flushed out. On the other hand, the applicants realized that a wetting agent applied to the surface of a porous diffuser (Cosentino's oxygenator is neither porous nor a bubble diffuser) will cause the emitted bubbles to be smaller. Wetting agents are well known, yet no art is believed to exist that teaches using them to prolong bubble curtain life. An obviousness rejection requires a reason for combining references. The *KSR* opinion requires that the analysis supporting a §103 rejection should be "made explicit," and that it is "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. It is not inherently obvious that (1) the most important factor in bubble curtain duration is rise time of the bubbles; (2) smaller bubbles rise more slowly than larger bubbles; or (3) a wetting agent applied to the emitter surface will cause emitted bubbles to be smaller. None of these three elements are inherently obvious, yet all three would need to be realized to decide to use a wetting agent to prolong bubble curtain life. None of the three references teaches or suggests any of these three elements.

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CONCLUSION

The applicants respectfully request reconsideration of the claim rejections in light of the above arguments, and that an Advisory Action be issued allowing all pending, non-withdrawn claims.

Respectfully submitted,

Date: 17 June 2008

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